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# The Role of Interests, Abilities, and Motivation in Online Idea Contests

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## ABSTRACT

Despite the growing importance of crowdsourcing activities, little is known about the influence of intrapersonal characteristics of external actors on the outcome for the involved firms. This study therefore explores how interests, abilities, and motivation explain contribution behavior of individuals in idea contests. Analyzing a data set that combines survey data and server log file information of 33 idea contests hosted by the platform operator Atizo, we find that the breadth of individuals' interest is positively related to the number of submitted solution ideas. Furthermore, we observe a positive interaction effect between enjoyment and professional experience on contribution behavior. According to these findings, the most valuable external actors identified in this study combine high levels of motivation with abilities and have a wide range of interests. Our study contributes to existing research and is useful for firms and platform managers that are involved in crowdsourcing activities.

## Keywords

Open Innovation; Crowdsourcing; Idea Contests

## 1. INTRODUCTION

In today's dynamic business environment, firms are required continuously to create new and innovative products and services. In order to discover novel ideas and innovation opportunities, firms frequently make use of existing knowledge and experiences, but have also started to search for ideas and innovations outside the boundaries of the firm. Among the most popular forms of this so-called outside-in process [1] are R&D cooperations between public as well as private institutions, innovation communities or idea contests. In particular, the latter two - online communities and idea contests - provide firms with the opportunity to access the "wisdom of the crowd" [2-4]. This approach is often referred to as "crowdsourcing" and builds upon the idea that large groups of individuals solve innovation-related problems better than an elite few [2]. Crowdsourcing has become a frequently used source for innovation inputs for firms. This rise in importance is mainly

due to the Internet as it offers global accessibility and enables geographically dispersed groups of people to interact and discuss topics of common interest. Crowdsourcing activities in the form of web-based idea contests are one means of integrating external ideas into a firm's innovation process. Idea contests are competitions for innovators who apply their experience and creativity to find novel solutions to a topic defined by a firm [5, 6]. Previous research showed that idea contests are able to deliver usable and valuable outcomes [7-10]. Using idea contests as an extension of a firm's internal innovation processes promises several advantages: on the one hand, they offer access to a large pool of skilled and motivated contributors, as well as a closer proximity to customers and users. On the other hand, the field in which solutions to a particular problem are searched is broadened. Both factors help to avoid a local search bias and firms can exploit the benefits resulting from complementary (user) innovations [3, 10, 11]. All these factors are especially important when firms are in search of truly innovative ideas for products or services.

This study aims to shed more light on intrapersonal factors explaining contribution behavior of individuals in idea contests. More specifically, we address the questions of how the ability and motivation of participants influence the number of submitted solution ideas, and what effect the breadth of interest has on contributions.

Despite the growing importance of external actors when searching for innovation inputs, little is known about how the abilities of these actors interplay with motivations and the way these individual characteristics influence the performance in idea contests. In this study, we refer to a widely discussed concept in organizational behavior literature that uses cognitive theories to predict individual effort levels and human performance. An individual's performance is often seen as a function of ability - in the form of knowledge and skills - and motivation [12]. Klehe and Anderson [13] state that there is a clear difference between how well an individual is able to perform (maximum performance) and his willingness to do so (typical performance). While both ability and motivation are antecedents of performance in any task, their required levels and their combination may vary depending on the situation. The specific setting of idea contests characterized by voluntariness of contribution highlights the importance of motivation in fully exploiting a participant's abilities.

In addition, we follow Mednick's theory of the associative basis of the creative process [14] when considering the influence of an individual's breadth of interest on the number of submitted solution ideas. Being interested in various fields is accompanied by gaining associative linkages between different concepts, which in turn enlarges an individual's associative basis. As the latter facilitates the creative potential, we expect individuals with a broad associative basis to be frequent contributors to idea contests.

Accordingly, we expect ability (in the form of professional experience), motivation (in the form of enjoyment) as well as breadth of interest to increase the number of submitted solution ideas. Considering that ability and motivation are both necessary for reaching a maximum performance level, we also expect to observe a positive impact of the interaction effect between both variables on contributions.

Our study extends the literature on idea contests in the following ways. Firstly, we look at ability and motivation as predictors of performance in idea contests. While there is considerable empirical evidence in organizational psychology literature on the impact of both variables on job performance [e.g. 12, 13, 15], studies on crowdsourcing have so far mainly investigated either motives [e.g. 10, 16] or abilities [9]. Secondly, by considering the breadth of participants' interest, this study incorporates a psychometric concept that has received only limited attention from prior research on crowdsourcing and communities.

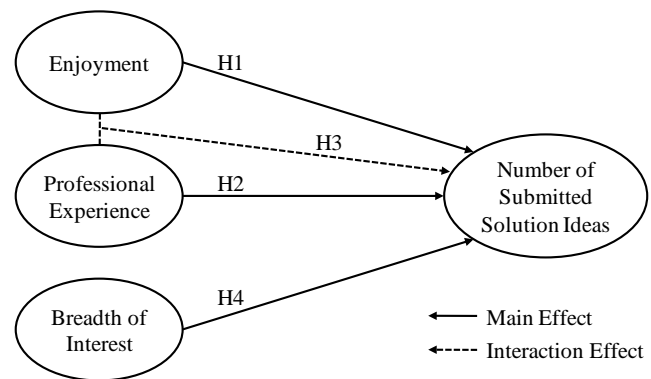
The data for this empirical research was provided by an innovation platform hosted by the Swiss start-up company Atizo. Atizo, similarly to InnoCentive [8, 9], acts as an intermediary between the registered members of the platform and firms looking for new product and service ideas. Our analysis reveals that the breadth of an individual's interest is the strongest predictor of the number of submitted solution ideas to an idea contest. As expected, therefore, a broad associative basis seems to be a strong driver of creativity in idea contests. We also found evidence of a strong combined effect of enjoyment and professional experience on the number of solution ideas. This finding confirms the notion that, in order to reach high performance levels, individuals need sufficient levels of motivation and adequate abilities.

The rest of the paper is organized as follows. Section 2 starts with the presentation of our research model and the development of the hypotheses. In section 3, we provide details of the empirical methods used in this study and subsequently present the empirical results of our analysis in section 4. Finally, we discuss the empirical findings of our study (section 5) and describe practical implications (section 6).

## 2. HYPOTHESES

We expect the performance of individuals to be driven by different intrapersonal factors. We therefore consider interests, abilities, and motivation as factors influencing an individual's performance in online idea contests. The research model presented in figure 1 provides an overview of the relationships we propose and test in this paper. It accounts for the main effects of enjoyment (H1), professional experience (H2) and breadth of interest (H4) on the number of submitted solution ideas. It also investigates the joint effect of enjoyment and professional experience on the number of submitted solution ideas (H3). The subsequent sections will deal with each of these hypotheses in detail.

**Figure 1. Research Model**



### 2.1 Enjoyment

Literature on individuals' motives to perform a certain task generally differentiates between two types of motivation: intrinsic and extrinsic [17, 18]. While intrinsically motivated individuals become active because of the task itself, extrinsically motivated individuals see the task as a means to achieve goals such as status or monetary rewards that can be reached by performing a certain task [18]. Within the literature on open innovation communities, different motives for participating in and contributing to these communities have been found. These studies were able to show that intrinsic motivators such as a joyful, exciting or challenging task are perceived by participants as being more important for contributing than extrinsic motivators such as monetary rewards [e.g. 10, 16, 19, 20]. Specific attention has been devoted to the feeling of enjoyment when contributing and a number of studies have underlined the importance of this motive [10, 21-24]. Several studies confirm the notion that enjoyment positively influences contribution behavior. For instance, Lakhani and Wolf [20] found in their study on open source software (OSS) development that individuals experiencing high levels of enjoyment spend more hours working on development projects than others. In similar vein, Hertel, Hermann and Niedner [16] discovered that enjoyment positively influenced the number of accepted patches and lines of code in the Linux project.

Accordingly, we expect that enjoying the task of finding innovative solution ideas is an important predictor of the number of ideas a participant submits. To develop a valuable solution idea, participants need to spend time and effort in elaborating the solution idea. When participants do not enjoy this creative problem-solving process, they may be unlikely to show the necessary level of engagement and perseverance. Based on these considerations, we hypothesize the following:

**H1:** The level of enjoyment an individual experiences while contributing will be positively related to the number of submitted solution ideas.

### 2.2 Professional Experience

Empirical studies in organizational psychology have repeatedly shown that professional experience has a positive influence on job performance [e.g. 25, 26, 27]. Through prior experiences individuals acquire skills and knowledge that in turn increase job performance [28]. However, it is unclear whether this relationship can also be observed in online idea contests, as existing research in this field has paid only limited attention to this subject.

Nevertheless, by relying on two existing theories, the theory of identical elements and the theory of generalization, we expect to find a similar relationship in the context of online idea contests.

The theory of identical elements [29] argues that the transfer of pieces of knowledge from one context to another is possible due to identical elements in both. This ability to transfer knowledge between contexts is widely determined by the stock of existing knowledge since individuals tend to make use of knowledge already in their possession rather than searching for new information [30], when engaging in creative problem-solving. The importance of such knowledge transfers between different domains or contexts is underlined by the finding that they often lead to innovative ideas [31-33].

Similarly, the theory of generalization [34] proposes that higher levels of professional experience are associated with the acquisition of problem-solving skills and methods that, once learned, can be applied to a great variety of contexts as they are rather generic in nature. With increasing professional experience, individuals not only possess a higher knowledge stock of such procedures and methods but they are also capable of categorizing and recognizing similar problem types more easily and accessing the relevant solution procedures more rapidly [35].

To summarize, professional experience leads to an increased knowledge and facilitates the transfer and application of this knowledge to novel problems and situations. It is thus hypothesized that the more professional experience a user has, the more solution ideas he will post on the platform:

H2: An individual's professional experience will be positively related to the number of submitted solution ideas.

### 2.3 Enjoyment and Professional Experience

Coming to the interaction effect between enjoyment and professional experience, we expect to find a positive and therefore reinforcing effect on the number of submitted solution ideas. Studies in organizational behavior literature argue that it is not enough merely to possess the required abilities – in the form of experience, knowledge, and skills – but that an individual must also be motivated to apply these abilities to the task at hand. Consequently, performance is seen as a function of both the performers' ability and their motivation [12, 13]. Klehe and Anderson [13] have shown that there is a clear difference between one's ability to perform well (maximum performance) and the willingness to do so (typical performance). Furthermore, in creative work, abilities and motivation are argued to be important factors [36].

Overall, abilities and motivation can be seen as antecedents of performance in any task. The impact of each, however, may vary depending on the context of the task to be performed [13]. Idea contests are characterized by voluntary contributions to the development of new products and services. Consequently, as participants choose to contribute of their own free will, users must combine motivation and abilities in order to generate a high number of solution ideas. Participants who are not sufficiently motivated to engage in creative problem-solving will post fewer solution ideas or even remain inactive. Vice versa, a high level of motivation will not lead to an increased number of solution ideas if the participant does not have the required abilities [36]. Hence, participants who possess the necessary knowledge and skills, gained through professional experience, and who enjoy spending

time on creative problem-solving should come up with a higher number of solution ideas than other participants.

Accordingly, we expect the interaction effect of enjoyment and professional experience on the number of submitted solution ideas to be positive:

H3: The interaction of higher levels of professional experience and enjoyment will increase the number of submitted solution ideas.

### 2.4 Breadth of Interest

Literature on the psychology of interests distinguishes between individuals with broad or narrow interests [37]. The breadth of interest reflects "an intellectual curiosity about a diversity of topics" [38]. Jackson [38] conceptualized breadth of interest as one of 15 scales in the Jackson Personality Inventory – Revised. Similar to the Five-Factor Model [39], it is used for the assessment of an individual's traits. Although previous research on idea contests and crowdsourcing has so far paid little attention to breadth of interest as a factor influencing contribution behavior, we expect breadth of interest to be especially important when trying to come up with creative inputs for idea contests. Individuals interested in a broad range of topics and thus open to experience, encounter more concepts in different contexts than people with narrow interests. Consequently, they enrich their basis of associative linkages between multiple concepts and ideas in their mind [40]. The resulting broad associative basis can be seen as a source of creativity, as it facilitates both the generation of a high number of ideas and divergent thinking in the form of unusual, inventive, or remote associations. This notion is well supported by Mednick's theory of the associative basis of the creative process [14] and Guilford's model of divergent thinking [41]. Accordingly, we expect individuals with a broad interest to be in a better position to generate a high number of ideas in different contexts than people with narrow interests. A broader range of interests should inspire participants to explore different alternative solutions to a given problem, allowing them to generate a higher number of solution ideas.

We therefore consider the breadth of an individual's interest to be a predictor of the number of submitted solutions ideas, and hypothesize that:

H4: The individual's breadth of interest will be positively related to the number of submitted solution ideas.

## 3. METHODS

### 3.1 Empirical Setting

This study is based on an open innovation platform hosted by the Swiss start-up company Atizo. Atizo, founded by two business school graduates and a software engineer, brings together firms seeking outside help in creating ideas for innovative products or services and external actors with the willingness and skills to engage in these contests. Similarly to InnoCentive, Atizo acts as a virtual knowledge broker as it offers solution seeker firms the possibility of broadcasting idea contests to the members of its platform [8, 9, 42]. Atizo's open innovation platform currently consists of more than 8,000 registered members, and over 80 different idea contests have been held so far. Among the various idea contests posted on Atizo, for instance, is one from the German car and motorcycle manufacturer BMW, asking participants which unique and exciting features or services future customers would expect from their motorbikes. Another example

is a call for ideas on what kind of banking services a financial service company could offer to its private customers on smartphones. A more technical contest asked for ideas on how conventional mechanisms used to trigger emergency stops for conveyor bands could be substituted with alternatives less prone to accidental deployments. In total, more than 60 firms including telecommunication providers such as O<sub>2</sub> and Swisscom, clothing manufacturers such as Odlo or Mammut, FMCG manufacturers such as P&G, or Wander, a subsidiary of Associated British Foods, have so far broadcast product and service development tasks on Atizo's platform.

The idea contests held on Atizo are usually open for submission for two months and promise monetary rewards of up to 5,000 Swiss francs. They are initiated by an open call to all registered members on Atizo. The participants then submit a description of their idea. The way solution ideas are presented to the seeker firm differs depending on the idea contest and the solution requirements defined by the broadcasting firm. Accordingly, the form of solution ideas submitted can range from rough descriptions of basic ideas by keywords to more detailed explanations including visualizations and/or details of technical concepts. Every submission contains only one solution idea, but members are allowed to submit several solution ideas to one contest. After the specified deadline has been reached, the public brainstorming session is closed and the solution ideas are evaluated by the seeker firm. The predefined prize money is then awarded to the most promising solution ideas.

This study investigates 33 different idea contests that were hosted by Atizo during the second half of 2008 and the first half of 2009. The idea contests held during this year cover a great variety of business sectors. In total, the cash rewards promised for these projects came to 83,500 Swiss francs.

### 3.2 Measures

*Enjoyment* was conceptualized as a reflective three-item scale capturing the enjoyment a participant derives from contributing to idea contests. For the development of the measure, we reviewed existing motivation measures from studies on OSS projects and other innovation-related platforms [10, 16, 19, 20, 43, 44]. The final measure captures the three aspects fun, interest and enjoyment in performing a task and is similar to the measure that was developed by Ghani and Deshpande [45]. The items were measured using a six-point Likert-type scale ranging from strongly disagree (1) to strongly agree (6). After having pre-tested the measure on 50 business administration students, we slightly changed the wording of the items in order to improve content validity and comprehensibility.

*Professional experience* captures how many years of professional experience a participant possesses. It was measured using data from the participants' profiles on the platform, in which they provided this information. This conceptualization of professional experience has been applied in several studies in organizational contexts [e.g. 25, 46].

*Breadth of interest* captures an individual's span of interest. This conceptualization is analogous to the trait breadth of interest, which is one of 15 scales in the Jackson Personality Inventory – Revised [38]. When registering on the Atizo platform, participants had to indicate their interests on a list of 174 areas of interest in nine different categories. To measure the breadth of interest, we computed the number of indicated interests.

For the endogenous variable *number of submitted solution ideas*, we measured how many solution ideas a participant submitted during the first twelve months after the official launch of Atizo in 2008 by assessing Atizo's server log files.

### 3.3 Data Collection and Sample Description

To avoid a potential common method bias, the research design is based on different data sources for the exogenous and endogenous variables in the model. We collected information on participants' motivation with an online questionnaire. The data on professional experience and breadth of interest was obtained from participants' individual profiles on the platform, and the number of submitted solution ideas was extracted via server log-file analysis.

The data collection started in 2008 and was divided into two phases. During the first phase, in the first half of 2008, we conducted an online survey of participants in a pilot operation of Atizo. A personalized link to the online questionnaire was sent via e-mail to all 288 participants, who were active within this time frame. A total of 209 responses were received. This equals a relatively high response rate of 72.6%. In the second phase, starting with the official introduction of Atizo in the second half of 2008, we collected data on the number of submitted solution ideas in the 33 idea contests that were broadcast in the following twelve months on the platform. Subsequently, we used the anonymized e-mail addresses of the participants as an identifier for matching the mentioned data with the information obtained from participants' profiles. Due to participants changing their e-mail addresses in their profile during the data collection process, we had to exclude 11 data sets that could not be unambiguously assigned. This resulted in an effective sample size of 198.

Table 1 shows the sample characteristics for gender, age, and education as well as the total number of submitted solution ideas.

**Table 1. Sample Characteristics**

	Sample (n=198)
Gender	19% female 81% male
Age (mean)	32 years
Education	52 % university degree
Number of submitted ideas	1,492

Our sample of platform participants consists of 19% female and 81% male respondents. These numbers are very similar to the gender distribution of all registered members of Atizo (21% female; 79% male). The respondents in our sample were on average 32 years old and 52% of them held a university degree. They submitted in total 1,492 solution ideas to the 33 idea contests we analyzed (see table 1).

## 4. RESULTS

To test the hypotheses, we used partial least square (PLS) structural equation modeling with the software SmartPLS 2.0 M3 [47]. The advantages of PLS include small required sample sizes, relatively soft distributional assumptions, reflective and formative measurements, and the modeling of direct, indirect and interaction effects [48]. PLS is therefore considered to be a suitable approach for this study. Although PLS estimates the model parameters by simultaneously assessing the measurement model and the

structural model [49], the results of a PLS model are presented in two steps. The first step involves the assessment of the reliability and validity of the measurement model. The second step includes the analysis and interpretation of the structural relationships.

#### 4.1 Measurement Model

For the assessment of the measurement model, we examined construct and indicator reliability as well as convergent and discriminant validity.

We assessed the reliability of the reflective motivational construct by examining the composite reliability (CR). This criterion assesses whether a given block of indicators is internally consistent [50, 48]. The threshold value of 0.7 should be exceeded in early stages of research processes and values above 0.8 or 0.9 are defined as satisfactory in more advanced stages of research [51]. A composite reliability for the variable enjoyment of 0.88 indicates a satisfactory level of construct reliability (see table 2).

The correlation between a construct and a manifest variable determines the indicator reliability. The standardized outer loadings should exceed the threshold of 0.707, indicating that more than 50% ( $0.707^2$ ) of an indicator's variance is due to the corresponding construct [52]. All indicators assigned to the variable enjoyment exceed this threshold (see table 2).

**Table 2. Construct Reliability and Item Wording**

	$\lambda$	t-value
<b>Enjoyment</b> (CR = 0.88; AVE = 0.71)		
Why do you participate in this open innovation platform?		
It is fun.	0.81	5.01
It is interesting.	0.79	5.02
It is enjoyable.	0.93	5.72

Convergent validity is assessed by analyzing the degree to which a set of indicators represent the same underlying construct. [53]. A threshold value of 0.5 for the average variance extracted (AVE) indicates that, on average, more than half the variance of the indicator is explained by the latent variable [54]. An AVE value of 0.71 signifies sufficient convergent validity for the reflective construct of enjoyment (see table 2).

Discriminant validity is a measure of the extent to which two conceptually different constructs diverge from one another. As our study design is primarily based on single-item measurements, we examined the correlation of constructs for the assessment of discriminant validity. The relatively low inter-construct correlations imply distinct and separate variables (see table 3).

**Table 3. Inter-construct Correlations<sup>a</sup>**

	1	2	3	4
1. Enjoyment	<i>0.84</i>			
2. Professional experience	0.02	<i>1.00</i>		
3. Breadth of interest	0.08	0.24	<i>1.00</i>	
4. Number of submitted solution ideas	0.14	0.16	0.39	<i>1.00</i>

<sup>a</sup> Italic numbers on the diagonal show the square root of the AVE.

In summary, all quality criteria for the reliability and validity of the measurement model are met. Hence, it can be used to test the structural model and the corresponding hypotheses.

#### 4.2 Hypotheses and Model Testing

As mentioned before, the second step in the evaluation of a PLS model focuses on the assessment of structural relationships. The interaction term between enjoyment and professional experience was formed by multiplying the standardized indicator values of the two exogenous variables. For the assessment of the significance of structural paths, t-values were calculated using a bootstrapping routine with 500 samples.

The predictive power of a PLS model is assessed by  $R^2$  values, where results of 0.19, 0.33 and 0.67 can be classified as weak, moderate and substantial [48]. The  $R^2$  for the number of submitted solution ideas is 0.21. Accordingly, our model explains an acceptable ratio of the variance in the endogenous variable.

Additionally, we calculated Cohen's  $f^2$  to assess the effect size of the interaction term.  $f^2$  values of 0.02, 0.15, and 0.35 can be interpreted respectively as small, medium and large effects [55].

Figure 2 shows the estimated standardized path coefficients and the corresponding levels of significance.

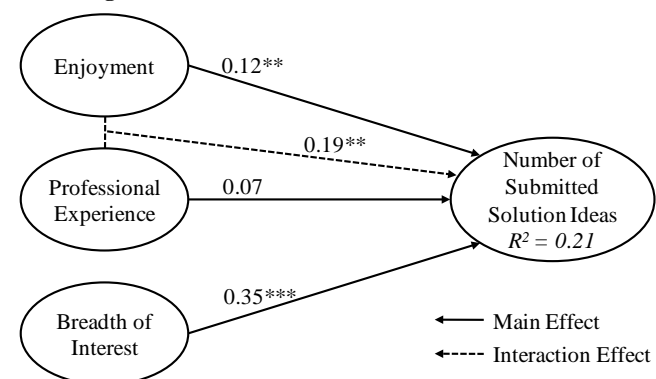
H1 suggested a positive relationship between enjoyment and the number of submitted solution ideas. H1 is supported as the path is positive and significant ( $\beta = 0.12$ ,  $p < 0.05$ ).

H2 predicted that professional experience has a positive association with the number of submitted solution ideas. We found a positive but not significant path coefficient ( $\beta = 0.07$ ,  $p > 0.1$ ). H2 is therefore not supported.

We argued in H3 for a positive interaction effect of enjoyment and professional experience on the number of submitted solution ideas. The combined path is positive and significant with weak to medium effect size ( $\beta = 0.19$ ,  $p < 0.05$ ,  $f^2 = 0.04$ ). Thus we find support for H3.

H4 proposed a positive association between the breadth of interest and the number of submitted solution ideas. We found support for H4 as the hypothesized path is positive and significant ( $\beta = 0.35$ ,  $p < 0.01$ ).

**Figure 2. Research Model with Path Coefficients<sup>a</sup>**



<sup>a</sup> n = 198; \*\*p < 0.05, \*\*\*p < 0.01

## 5. DISCUSSION

With this study, we aimed to investigate how intrapersonal factors influence the number of submitted solution ideas in idea contests. The conceptualization of our model is twofold. Firstly, it builds on motivational theories [12, 13, 15, 36] by considering abilities and motivation. In accordance with these theories explaining human performance, we found that the combination of adequate abilities and sufficient motivation fosters a high number of submitted idea solutions. Secondly, we paid special attention to the breadth of interest and investigated its role in idea contests. Our findings show that individuals' breadth of interest enables participants to contribute frequently to idea contests.

The finding that enjoyment is an important predictor of the activity level in idea contests is in alignment with several studies investigating motives to participate in crowdsourcing activities [10, 16, 19, 20]. Individuals who enjoy coming up with new ideas and whose motivation thus lies in performing the task itself are more willing to spend time on the platform and to generate different and elaborated ideas [20]. As Shah and Kruglanski [56] pointed out, people who feel enjoyment in performing a task, i.e. are intrinsically motivated, derive a positive feeling when engaging in this task which may stem from an enhanced feeling of competence, autonomy, and self-expression.

Contrary to hypothesis 2, we did not find a significant effect of professional experience on the number of submitted solution ideas. However, our findings add evidence to the existence of an interaction effect between enjoyment and professional experience. Whereas enjoyment showed a positive and significant effect on its own, professional experience did not reach significance. This finding is consistent with motivation theories explaining an individual's performance by the interaction of one's abilities and motivation [12]. Participants are not only required to possess a sufficient stock of knowledge and experience, they also need the necessary level of motivation to apply this knowledge. Given the fact that users contribute to an idea contest on a voluntary basis, it seems reasonable that motivation is essential for activating an individual's abilities.

Finally, our findings show that the breadth of one's interest is the strongest predictor of the number of submitted solution ideas to an idea contest. This observation is in accordance with Simonton [40], who argued that having wide interests positively influences the creation of linkages between various concepts and ideas. A broad interest base prompts individuals to contribute a higher number of solution ideas, because they are able to create multiple associations between the idea contest's topic and concepts they have encountered when following their interests. The broad associative basis resulting from various interests is seen as a source of creativity [14]. The finding that breadth of interest has a stronger influence than knowledge in the form of professional experience on the number of submitted solution ideas may be explained by the setting of our study. Idea contests are primarily a means of benefiting from a participant's creativity, since participants are asked to pitch idea sketches and not to submit detailed concepts. This stands in contrast to innovation contests, where knowledge is much more important since participants are not only expected to generate inventive ideas but also to develop concepts describing the feasibility of the solution [57].

Summarizing our findings, this study contributes to the understanding of intrapersonal factors explaining an individual's contribution behavior in idea contests. By considering abilities

(professional experience) and motivation (enjoyment), our study is one of a few in this context [58, 59] taking up well-known and widely used psychological concepts explaining human performance as a function of skills and the willingness to use these skills. Additionally, by integrating breadth of interest, this study applies a personality trait to explain contribution performance that has received only marginal attention by the existing research on open innovation.

Future studies may further refine the measurement of activity in idea contests by investigating the quality of the submitted solution ideas. The quality of the submitted solution ideas can be seen as an important determinant of success or failure of platforms such as Atizo. In business, an idea must not only be original but must also be applicable and workable [36]. The most original idea may not be the most suitable for solving a problem encountered in a firm. An idea may not be realizable because of budget or resource constraints, it may not be interesting from an economic perspective, or it may simply not be marketable due to the lack of consumer need for such a product or service. Only when businesses are able to derive real value from idea contests, are they willing to spend money and time on finding new ideas by starting an idea contest. Additionally, further research could investigate whether the scope of crowdsourcing activities, i.e. idea contests or innovation contests, impacts on the relative importance of factors explaining contribution behavior. For instance, creativity is expected to be more important in idea contests since participants are only required to sketch ideas. Innovation contests, however, may require more profound knowledge on the subject of the innovation challenge because contributors are expected to deliver more detailed concepts. We therefore consider it worth investigating whether Amabile's [36] three factors determining creative problem-solving (expertise, creative thinking skills, and motivation) vary in their importance for different forms of crowdsourcing.

## 6. IMPLICATIONS

Idea contests, as offered by the open innovation platform Atizo, are an easily applicable and relatively inexpensive opportunity for firms to gain inputs for innovative products and services. For operators of similar innovation platforms or firms wanting to start their own online idea contest, we have the following practical implications.

As regards the intrinsic motivation of participants that stems primarily from the task of creative idea generation itself, we recommend designing an enjoyable and exciting online environment that is inspiring and allows intuitive navigation. This could be achieved, for example, by providing the participants with functions such as personalized start pages including feeds from favorite projects, individualization of profile sites, chat rooms, rating possibilities, comment function, etc.

With respect to the abilities of participants, operators of innovation platforms should consider the option of enabling collaborative problem-solving. This seems to be especially promising when contests require in-depth conceptual work. Participants could benefit from each others' abilities, i.e. their knowledge and professional experience, since the knowledge base an individual is able to draw from can be complemented by the knowledge of other participants. Furthermore, innovations are often created by tacit knowledge, i.e. knowledge that is embodied, implicit and therefore not easily accessible [60]. In order to access and benefit from such tacit knowledge, collaboration is of utmost

importance since interaction between individuals is a means of making tacit knowledge explicit [61]. To make tacit knowledge available to third persons or institutions, the creation of a context in which personal relationships and conversations can evolve is essential [62]. The concept of Ba, i.e. the idea of creating a place in which individuals share, create and apply knowledge, is especially promising in this context [63]. It involves a spiraling process in which interactions between explicit and tacit knowledge lead to the creation of new knowledge [64]. Such an environment comprises adequate resources (e.g. software that facilitates the division of innovation challenges into subtasks, communication among geographically dispersed persons), sufficient time to solve the contest at hand, encouragement (i.e. feedback from the seeker firm) and freedom from criticism (i.e. constructive feedback) [65].

According to the findings of our study, participants with broad interests are the most valuable in idea contests. As it seems not to be feasible to select participants by their breadth of interest, we recommend that providers of idea contests should facilitate the drawing of parallels and associations. A possible way of enlarging participants' associative basis on which new ideas are developed could be the creation of tag clouds. To foster the creation of truly innovative ideas, we recommend that platform operators should not highlight in the tag cloud those words that are mentioned the most – as is usually the case – but those that have been used only rarely. The concept of an inverted tag cloud seems to be a promising way of enriching the associative basis. This in turn should help individuals to come up with new, creative ideas by providing hints on how other concepts or domains could be applicable to the solution of the problem at hand.

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